A STUDY ON THE SIZE ANOMALY IN THE HONG KONG STOCK MARKET AND ITS RELATION TO SEASONALITY

by

MOK, Wai Man Ronald

莫偉文

MBA PROJECT REPORT

Presented to

The Graduate School

In Partial Fulfilment

of the Requirement to the Degree of

MASTER OF BUSINESS ADMINISTRATION

TWO-YEAR MBA PROGRAMME

THE CHINESE UNIVERSITY OF HONG KONG

May 1992

Mr. Paul McGUINNESS B.

Advisor

ABSTRACT

This research project is performed to investigate the firm size anomaly in the Hong Kong stock market for the period from 1988 to 1991 and its relation to return seasonality. Five portfolios of different size are constructed and their raw returns as well as excess returns based on the market model are examined. It is found that the Hong Kong stock market exhibits a reverse firm size effect. Smaller firms under-perform larger firms and generate significantly negative excess returns (i.e. returns less than expected ones based on market models) even after adjusting for risk and infrequent trading. This contradicts the findings from most parts of the world. Although no seasonality is observed in the Hong Kong stock market, the reverse firm size effect, to a certain extent, is more pronounced in August and December. The findings may suggest the inefficiency of the Hong Kong stock market. Another possibility is that there is a misspecification of the CAPM. Besides, the phenomenon may be just a statistical artifact.

ACKNOWLEDGEMENTS

I am greatly indebted to Mr. Paul McGuinness B. for being my project advisor. Through his helpful guidance and assistance, I can manage to complete the project in the smoothest manner.

I would also like to take this opportunity to express my thanks to all my classmates for their immense help. My thanks also extend to my family for their continual support.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

It has long been postulated that in an efficient market, stocks are rationally and competitively priced and that the share prices fully reflect the information available. In other words, stocks are priced to provide a normal return for their level of risk. Therefore, the expected return of a share is directly related to its perceived risk and in the long run, no one can earn abnormal returns in an efficient market. Many models have been developed to account for this. One of the most widely used is the Capital Asset Pricing Model (CAPM). According to this model, the expected return of a portfolio is a linear function of its systematic risk. However, many researchers have uncovered certain anomalies in stock price behaviour. Many papers have documented that excess returns can be earned over time by considering certain variables, the effects of which are not specified in any asset pricing model such as CAPM. One of the most widely studied anomalies is the "*firm size effect*" [see Banz (1981)[1]].

---

[1]Banz, Rolf W. "The Relationship between Return and Market Value of Common Stocks." *Journal of Financial Economics*, Vol. 9 (1981), pp. 3-18.

1.1 *Firm Size Effect*

Firm size effect, also known as small firm effect, is an anomaly that still confounds researchers. It reveals a relation between the stock return of a firm and the total market value of its common equity. Evidence has shown that shares of small firms (those with a low total market value of common stock) produce consistently larger average returns than shares of large firms, even after being adjusted for differences in estimated risk. For example, Banz (1981)[2] found that holding a portfolio of small firms long and selling a portfolio of large firms short produces excess returns of about 20% per annum. Such firm size phenomenon does not just occur in U.S. stock market and it has been observed in various stock markets such as those in U.K., Australia and Singapore.

Much research has been done in an attempt to explain this anomaly. As a result, some possible explanations such as tax effects, transaction costs, infrequent trading of small firm stocks, beta biases, return measurement techniques and ownership structure have been suggested and investigated extensively. However, no adequate answer has yet been arrived.

---

[2] *ibid.*

1.2 *Hong Kong Situation*

Hong Kong is one of the most important financial centres in the world and the behaviour of its stock market is of much concern to investors. Pang (1988)[3] has examined the Hong Kong stock market for the period from 1977 to 1986 and found that there is a reverse firm size effect in the raw returns, i.e. stocks of small firms produce smaller returns than those of large firms. However, after adjusted for risk, small firm effect appears in stock distributions and shares of large firms out-perform those of small ones.

The aim of this research project is to further investigate the firm size anomaly of the Hong Kong stock market for a more recent period, i.e. from January 1, 1988 to December 31, 1991. Since this period is after the establishment of the unified exchange, *The Stock Exchange of Hong Kong*, the Hong Kong stock market is more rationalised and the study of its behaviour is more worthwhile.

1.3 *Outline of the Research Report*

In this research report, a literature review on previous work is introduced in Chapter 2. Then a brief overview on the Hong Kong stock market is presented in Chapter 3. In Chapter 4, the objectives of this research project and the theoretical framework employed are given. The sample data and methodology are investigated

---

[3]Pang, K.L. Queenie, "An Analysis of the Hong Kong Stock Return Seasonality and Firm Size Anomalies for the Period 1977 to 1986", *Hong Kong Journal of Business Management*, Vol. 6 (1988), pp. 69-90.

in Chapter 5. Chapter 6 includes discussion and analysis of the empirical results. The implication of the results is discussed in Chapter 7.

CHAPTER II

LITERATURE REVIEW

Documentation of the existence of firm size effect can be traced back to the work of Banz (1981)[4]. Banz examines the empirical relationship between the return and the total market value of NYSE (New York Stock Exchange) common stocks and finds that in the 1963-1975 period, the common stock of small firms had, on average, higher risk-adjusted returns than the common stock of large firms. Reinganum (1981)[5] finds that portfolios based on firm size or E/P ratio earn abnormal returns for about two years. He also finds that a strong firm effect still occurs after controlling returns for E/P effect but E/P effect vanishes after controlling returns for market value effect. Hence, Reinganum concludes that firm size effect subsumes the effect of E/P ratio, which is documented by Basu (1977)[6] and shows a positive relation between risk-adjusted returns and E/P ratios of common stocks.

---

[4]*opcit.*

[5]Reinganum, Marc R. "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market Values." *Journal of Financial Economics*, Vol. 9 (1981), pp. 19-46.

[6]Basu, Sanjoy. "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis." *Journal of Finance*, Vol. 32 (1977), pp. 663-682.

The findings of Banz (1981)[7] and Reinganum (1981)[8] have caused many researchers to further investigate the firm size effect and to try to explain the existence of such an anomaly. Schwert (1983)[9] classifies these papers into 3 types:

1) papers that seek to attribute the findings of Banz (1981)[10] and Reinganum (1981)[11] to measurement or statistical testing errors;
2) papers that provide further evidence and more characteristics of the firm size effect;
3) papers that propose an explanation of the evidence.

The following review will be based on these 3 categories so as to provide a more comprehensive view of the previous studies on the firm size effect.

2.1 *The Size Effect as a Statistical Artifact*

Several papers have re-examined the statistical tests used in the papers of Banz (1981)[12] and Reinganum (1981)[13]. Roll (1981)[14] suggests that trading activity

---

[7]*opcit.*

[8]*opcit.*

[9]Schwert, G. William. "Size and Stock Returns, and Other Empirical Regularities." *Journal of Financial Economics*, Vol.12 (1983), pp. 3-12.

[10]*opcit.*

[11]*opcit.*

[12]*opcit.*

[13]*opcit.*

affects returns because the less frequent trading of small firm stocks causes the estimates of system risk from daily stock returns to be biased downward which in turn, causes excess returns to be over-stated. However, Reinganum (1982)[15] argues that the bias in risk estimates caused by infrequent trading of small firm stocks does not explain the magnitude of the risk-adjusted returns found by Reinganum (1981)[16].

James and Edmister (1983)[17] find that a liquidity premium for infrequent trading in smaller firms adds little to the explanation of firm size effect. In addition, Handa, Kothari and Wasley (1989)[18] report that the size effect is sensitive to the length of the return interval used in estimating betas since the estimated beta varies with the return interval. The longer is the interval used, the higher is the value of estimated beta. They also show that the size effect becomes statistically insignificant when risk is measured by betas estimated using annual returns.

---

[14]Roll, Richard. "A Possible Explanation of the Small Firm Effect." *Journal of Finance*, Vol. 36 (1981), pp. 879-888.

[15]Reinganum, Marc R. "A Direct Test of Roll's Conjecture on the Firm Size Effect." *Journal of Finance*, Vol. 37 (1982), pp. 27-35.

[16]Reinganum, Marc R. "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market Values." *Journal of Financial Economics*, Vol. 9 (1981), pp. 19-46.

[17]James, C. and Edmister, R. "The Relation between Common Stock Returns, Trading Activity and Market Value." *Journal of Finance*, Vol. 38 (1983), pp. 1075-1086.

[18]Handa, Puneet, Kothari, S.P. and Wasley, Charles. "The Relation between the Return Interval and Betas: Implications for the Size Effect." *Journal of Financial Economics*, Vol. 23 (1989), pp. 79-100.

Friend and Lang (1988)[19] suggest that size effect is due to the inadequacy of the usual measure of risk. They show that Standard and Poor's quality rankings assigned by security analysts are superior over beta and variance measures of risk in explaining returns and in subsuming the size effect. They conclude that size effect mainly reflects a risk effect, a significant part of which is not caught by the usual beta and variance measures.

Basu (1983)[20] examines the relationship between earnings/price (E/P) ratio, firm size and returns on the common stock of New York Stock Exchange (NYSE) firms. He constructs portfolios of stocks ranked on both size and earnings/price ratios and then adjusts the returns of these portfolios first for the effect of differences in their systematic risk and next for the differences in their total risk. In so doing, he finds that there is an association of stock returns with firm size and E/P ratios. The stocks with high E/P ratio generate statistically significant higher risk-adjusted returns than those with low E/P ratio. This E/P effect is still significant even after controlling for the differences in firm size. On the other hand, while stocks of firms with low market value earn considerably higher returns than the stocks of large firms, this size effect vanishes after controlling for risk and E/P ratios. This results contradict the

---

[19]Friend, Irwin and Lang, Larry H.P. "The Size Effect on Stock Returns: Is It Simply a Risk Effect not Adequately Reflected by the Usual Measures?" *Journal of Banking and Finance*, Vol. 12 (1988), pp. 13-30.

[20]Basu, Sanjoy. "The Relationship between Earnings' Yield, Market Value and Return for NYSE Common Stocks: Further Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 129-156.

results generated by Reinganum (1981)[21], which states that the size effect subsumes the E/P effect.

Cook and Rozeff (1984)[22] report that both the firm size and E/P ratio are significant to excess returns in the whole year rather than just in January. They conclude that stock returns are associated with both firm size and E/P ratio. In addition, Rogers (1988)[23] finds that both the firm size effect and E/P effect occur on the American Stock Exchange (AMEX). Among the two effects, he notes that firm size effect is more significant, which contracts with Basu's findings (1983) for the NYSE firms.

Jaffe, Keim and Westerfield (1989)[24] study the relation between the firm size and E/P effects over a much longer sample period of 1951-1986. They discover that both effects are significant over all months within the sample period, which is consistent with the findings of Cook and Rozeff (1984)[25].

---

[21] *opcit.*

[22] Cook, T.J. and Rozeff, M.S. "Size and Earnings/Price Ratio Anomalies: One Effect or Two?" *Journal of Financial and Quantitative Analysis*, Vol. 19 (1984), pp. 449-66.

[23] Rogers, R.C. "The Relationship between Earnings Yield and Market Values: Evidence from the American Stock Exchange." *The Financial Review*, Vol. 23 (1988), pp. 65-80.

[24] Jaffe, J., Keim, D.B. and Westerfield, R. "Earnings Yields, Market Values, and Stock Returns." *Journal of Finance*, Vol. 44 (1989), pp. 135-148.

[25] *opcit.*

Wong and Lye (1990)[26] analyze the stock returns of firms listed on the Stock Exchange of Singapore (SES) over a period of 1975-1985. They report that the returns of SES stocks are significantly related to both firm size and E/P ratio. Moreover, E/P effect appears to be predominant.

Roll (1983)[27] and Blume and Stambaugh (1983)[28] investigate the effects of the different portfolio strategies implicit in alternative estimators of risk-adjusted returns to portfolios of small firms' stocks. They find that the annualized arithmetic average daily risk-adjusted returns calculated by Reinganum (1981)[29] are about twice as large as the risk-adjusted returns to a portfolio that is purchased at the beginning of the year and held for an entire year. Roll reports that about half of the size premium of small firm can be explained by the use of compounded arithmetic average returns that assumes a daily rebalancing to attain equal weights for the stocks in the portfolio. Since the technique used to calculate average risk-adjusted returns affects the magnitude of the size effect, both Roll, and Blume and Stambaugh doubt the empirical importance of this phenomenon.

---

[26]Wong, K.A. and Lye, M.S. "Market Values, Earnings' Yields and Stock Returns: Evidence from Singapore." *Journal of Banking and Finance*, Vol. 14 (1990), pp. 311-326.

[27]Roll, Richard. "On Computing Mean Returns and the Small Firm Premium." *Journal of Financial Economics*, Vol. 12 (1983), pp. 371-386.

[28]Blume, Marshall E. and Stambaugh, Robert F. "Biases in Computed Returns: An Application to the Size Effect." *Journal of Financial Economics*, Vol. 12 (1983), pp. 387-404.

[29]*opcit*.

2.2 *Further Characterization of the Size Effect*

A number of studies have provided new evidence concerning the firm size effect. Keim (1983)[30] discovers that the abnormal returns of small firm stocks are consistently larger in January than in other months. Nearly half of the average magnitude of the risk-adjusted premium of small firms relative to large firms is due to January abnormal returns. Further, more than half of the size premium occur during the first five trading days of January. With these results, Keim relates the size effect to a January anomaly, being documented by Rozeff and Kinney (1976)[31], which shows that monthly rates of market return are the highest in January. Roll (1983)[32] notes the same results documented by Keim.

Brown, Kleidon and Marsh (1983)[33] finds that the relationship between size and excess returns is not stable over time within the sample period 1967-79. They note a linear relationship between the risk-adjusted returns and the size variable. However, the magnitude and sign of the relation vary within the sample period.

---

[30]Keim, Donald B. "Size-related Anomalies and Stock Return Seasonality: Empirical Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 13-32.

[31]Rozeff, Michael S. and Kinney, William R. "Capital Market Seasonality: The Case of Stock Returns." *Journal of Financial Economics*, Vol. 3 (1976), pp. 379-402.

[32]Roll, Richard. "Vas ist das? The Turn of the Year Effect and the Return Premium of Small Firms." *Journal of Portfolio Management*, Vol. 9 (1983), pp. 18-28.

[33]Brown, Philip, Kleidon, Allan W. and Marsh, Terry A. "New Evidence on the Nature of Size-Related Anomalies in Stock Prices." *Journal of Financial Economics*, Vol. 12 (1983), pp. 33-56.

There is a negative excess return for stocks of small firms between 1969-73 while a positive excess return is observed between 1974-79.

2.3 *Economic Explanations for the Size Effect*

After the documentation of firm size effect by Banz (1981)[34] and Reinganum (1981)[35], many studies have been carried out in an attempt to explain such a phenomenon.

2.3.1 Tax Effects

In response to the evidence of the relationship between firm size and January effects as documented by Keim (1983)[36], a number of papers try to explain the anomalies with the Tax Loss Selling hypothesis (TLS) which is originally proposed by Wachtel (1942)[37]. The hypothesis asserts that tax laws encourage the tax-year-end sale of shares that have declined in value over the previous year. The reason is that in doing so, investors can realize short-term capital losses and reduce their taxable income. Small firms are the likely candidates for tax loss selling because they have higher earnings volatility and tax-exempt investors, such as pension funds, hold relatively fewer shares of small firms. A selling pressure is thus created and

---

[34]*opcit.*

[35]*opcit.*

[36]*opcit.*

[37]Wachtel, S.B. "Certain Observations in Seasonal Movements in Stock Prices." *Journal of Business*, Vol. 15 (1942), pp. 184-193.

depresses the prices of this kind of stocks. After the tax year end, the selling pressure is relieved and the rebound of prices to equilibrium level causes an abnormal return to these stocks. In U.S., the tax year coincides with the calendar year and this explains the abnormal January returns.

Roll (1983)[38] and Reinganum (1983)[39] investigate whether the Tax Loss Selling hypothesis can be used to explain the January size effect. Both of them find that there is a positive relation between the magnitude of price increase in the first week of January and the magnitude of capital losses that could have been realized at the end of the previous year. However, Reinganum finds that those small firms which experience capital gains over the previous year and are least likely to be sold for tax reason also earn large average January returns. Moreover, the abnormal returns are not limited to first five trading days. Thus, Reinganum concludes that tax-loss-selling cannot explain January size effect.

2.3.2 International Evidence on Tax Effects

Since the discovery of stock return seasonality and firm size effect in U.S. market, several studies have been carried out to investigate whether the same anomalies occur in other stock markets.

---

[38]*opcit.*

[39]Reinganum, Marc R. "The Anomalous Stock Market Behaviour of Small Firms in January: Empirical Tests for Tax-loss Selling Effects." *Journal of Financial Economics*, Vol. 12 (1983), pp. 89-104.

Brown, Keim, Kleidon and Marsh (1983)[40] study Australian stock market and discover that Australian stocks earn much larger average returns in January and July than in the remaining ten months. They also note that although the portfolio with the smallest market value earns higher average monthly excess returns, the magnitude of the size premium is quite constant across all months. Hence, size effect seems to be independent of the seasonality. Furthermore, since the tax year ends in June in Australia, the existence of abnormal January return appears to be inconsistent with the Tax Loss Selling hypothesis.

Gultekin and Gultekin (1983)[41] examine the stock markets in 17 countries and note seasonality with large January returns in most countries. U.K. stock market, as an exception, shows abnormal April returns. Since these months coincide with the turn of tax year in the respective countries, the findings support the tax loss selling hypothesis.

Berges, McConnell and Schlarbaum (1984)[42] examine monthly returns to five portfolios of stocks traded on the Toronto and Montreal Stock Exchanges and note the January effect in the Canadian market. This effect is more significant for stocks

---

[40]Brown, Philip, Keim, Donald B., Kleidon, Allan W. and Marsh, Terry A. "Stock Return Seasonalities and the Tax-Loss Selling Hypothesis: Analysis of the Arguments and Australian Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 105-127.

[41]Gultekin, M.N. and Gultekin, N.B. "Stock Market Seasonality: International Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 469-481.

[42]Berges, A., McConnell, J.J. and Schlarbaum, G.G. "The Turn-of-the-year in Canada." *Journal of Finance*, Vol. 39 (1984), pp. 185-192.

of small firms. However, this phenomenon appears to exist even before the introduction of capital gain tax by Canadian government, which suggests January size effect cannot be explained by tax-loss-selling.

Levis (1985)[43] discovers that London stock market demonstrates firm size effect and there are abnormal returns in January and April. His findings are consistent with those of Gultekin and Gultekin (1983)[44].

Santesmases (1986)[45] analyses the monthly returns of the Madrid Stock Exchange and discovers that there are high returns for the whole first quarter of the year and low returns for the last quarter of the year.

Kato and Schallheim (1985)[46] document small firm effect in Japanese stock market. They also note that small firms earn higher returns than large firms in January and June and that there is a negative relation between excess returns and the size of the portfolios.

---

[43]Levis, M. "Are Small Firms Big Performers?" *The Investment Analyst*, Vol. 76 (1985), pp. 21-27.

[44]*opcit*.

[45]Santesmases, M. "An Investigation of the Spanish Stock Market Seasonality." *Journal of Business Finance and Accounting*, No. 2 (1986), pp. 267-276.

[46]Kato, K. and Schallheim, J.S. "Seasonal and Size Anomalies in the Japanese Stock Market." *Journal of Financial and Quantitative Analysis*, Vol. 20, No. 2 (1985), pp. 243-260.

Pang (1988)[47] examines the Hong Kong stock market and finds that a small firm size effect exists in the risk-adjusted stock returns. She also notes that the Hong Kong stock market exhibits strong seasonality with large returns in January, April and December. Since Hong Kong does not have capital gains tax, she concludes that the results do not support the tax induced trading as the cause of the stock return seasonality in Hong Kong.

2.3.3 Transaction Costs

Some papers attribute the size effect to transaction costs. Stoll and Whaley (1983)[48] report that transaction costs are high for small firms' stocks because of their lower prices and wider dealer spreads (bid-ask spreads). By examining the monthly returns to 10 portfolios of stocks listed on NYSE, they find that the turn-around transaction costs[49], including dealer spread and commission rate, amounts to 6.8% for the smallest portfolio while only 2.7% for the largest portfolio. They further note that for a holding period between three months and a year, the mean abnormal return net of all transaction costs for the small firm portfolio is not significantly different from zero. Hence, they conclude that transaction costs at least partially account for the size abnormality.

---

[47]*opcit.*

[48]Stoll, Hans R. and Whaley, Robert E. "Transaction Costs and the Small Firm Effect." *Journal of Financial Economics*, Vol. 12 (1983), pp. 57-79.

[49]It is the compensation to the dealer on a turn-around transaction (purchase and sale). On a single transaction, the cost to the investor is one-half of it.

Schultz (1983)[50] studies the daily returns of stocks listed on American Stock Exchange (AMEX) and discovers that the round trip transaction costs for the small firm portfolio amounts to 11.4%. However, he uncovers that the small firm portfolio can earn abnormal returns net of all transaction costs even with holding periods of one month if the holding period includes a January. Moreover, he notes that transaction costs do not demonstrate seasonality which is a characteristic of the excess return documented by Keim (1983)[51]. As a result of these, Schultz concludes that firm size effect cannot be explained solely based on the transaction cost differences between small and large firms.

2.3.4 Ownership Structure

Lloyd, Jahera and Goldstein (1986)[52] examine the relationship among ownership structure, firm size and returns under the hypothesis that manager-controlled firms have higher returns in view of the risk inherent in the agency relationship and the risk is higher in the small firm. However, they find no significant relationship between ownership and return. They further note that it is not statistically significant to use ownership as an explanatory factor in the small firm effect.

---

[50]Schultz, Paul. "Transaction Costs and the Small Firm Effect: A Comment." *Journal of Financial Economics*, Vol. 12 (1983), pp. 81-88.

[51]*opcit*.

[52]Lloyd, William P., Jahera, John S. and Goldstein, Steven J. "The Relation between Returns, Ownership Structure and Market Value." The Journal of Financial Research, Vol. 9 (1986), No. 2, pp. 171-177.

2.3.5 Other modifications of the CAPM

Several papers have attempted to investigate whether there is a relation between the size effect and other variables. For example, Reinganum (1981)[53] uses the arbitrage pricing model of Ross (1976)[54] to inspect the relation between the risk-adjusted returns and firm size.

---

[53]Reinganum, Marc R. "The Arbitrage Pricing Theory: Some Empirical Results." *Journal of Finance*, Vol. 36 (1981), pp. 313-321.

[54]Ross, Stephen A. "The Arbitrage Theory of Capital Asset Pricing." *Journal of Economic Theory*, Vol. 13 (1976), pp. 341-360.

CHAPTER III

OVERVIEW OF THE HONG KONG STOCK MARKET

Share trading has a long history in Hong Kong, which can be traced back to 1866. The first formal stock exchange was set up by an association of brokers in 1891. Prior to 1960s, stock market activities were not important in Hong Kong and the stock exchange only played a minor role in corporate fund-raising. However, the economic boom in late 1960s has raised the importance of stock market. In 1970s, there were four stock exchanges, namely the Hong Kong Stock Exchange, the Far East Stock Exchange, the Kam Ngan Stock Exchange and the Kowloon Stock Exchange, within Hong Kong's tiny territory. As the Hong Kong stock market further developed, the need to rationalise the four exchanges became apparent. After much effort, a unified exchange, the *Stock Exchange of Hong Kong*, was opened in April 1986.

Nowadays, Hong Kong is one of the most important international financial centres in the world. At December 1990, 295 companies were listed on the Stock Exchange of Hong Kong, accounting for an equity capitalization of HK$650 billion which ranked Hong Kong fourth among Asian stock markets.

Despite its importance, the efficiency of the Hong Kong stock market is doubtful. Several studies, e.g. Dawson (1982)[55], Law (1982)[56], Wong and Kwong (1984)[57] etc., suggest the inefficiency of the Hong Kong stock market. However, since only little research has been conducted to investigate the behaviour of the Hong Kong stock market, a conclusion cannot be arrived without further studies.

---

[55]Dawson, S. "Is the Hong Kong Market Efficient?" *Journal of Portfolio Management*, 1982, pp. 17-20.

[56]Law, C.K. "A Test of the Efficient Market Hypothesis with respect to the Recent Behaviour of the Hong Kong Stock Market." *Developing Economics*, 1982, pp. 61-72.

[57]Wong, K.A. and Kwong, K.S. "The Behaviour of Hong Kong Stock Prices." *Applied Economics*, 1984, pp. 905-917.

CHAPTER IV

RESEARCH OBJECTIVES AND THEORETICAL FRAMEWORK

4.1 *Research Objectives*

Since Hong Kong is one of the most important financial centres in the world, the behaviour of its stock market is definitely of great concern to investors. As firm size effect is a widely observed anomaly across many stock markets in the world, it is worthwhile to see whether such anomaly exists in the Hong Kong stock market. Pang (1988)[58] has investigated the Hong Kong stock market for the period from 1977 to 1986 and observed a small firm effect. This research project is carried out to examine the firm size anomaly in the Hong Kong stock market for a more recent period. The objectives of this project are :

1) To investigate whether there is a firm size anomaly in the Hong Kong stock market for the period from 1988 to 1991;
2) To investigate whether firm size effect exhibits seasonality if it does exist;
3) To suggest possible implications for the results found.

---

[58]*opcit.*

4.2 *Theoretical Framework*

In order to investigate whether there are excess returns to a portfolio, a model is needed to provide an expected return of the concerned portfolio. In this research project, the Capital Asset Pricing Model (CAPM) is employed.

4.2.1 Capital Asset Pricing Model (CAPM)

Based on Markowitz's (1952)[59] work of portfolio theory, Sharpe (1964)[60] developed a theoretical model called Capital Asset Pricing Model (CAPM) for the pricing of capital assets in an uncertain economy. According to the model, the expected equilibrium return of a security is a direct function of the perceived risk. Mathematically, the model is written as

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

where
$E(R_i)$ = Expected return of a security i
R_f = Risk free return of the market
$E(R_m)$ = Expected return of the market
β_i = Systematic risk = $\dfrac{Cov(R_i,R_m)}{\sigma^2(R_m)}$

---

[59]Markowitz, Harry M. "Portfolio Selection." *Journal of Finance*, Vol. 7 (1952), pp. 77-91.

[60]Sharpe, William F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance*, Vol. 19 (1964), pp. 425-442.

4.2.2 Assumptions of CAPM

The model is developed based on several assumptions which are listed below.

i) The objective of investors is to maximize the utility of their terminal wealth.

ii) Investors make choices on the basis of risk and return. Return is measured by the mean returns expected from a portfolio of assets while risk is measured by the variance of these portfolio returns.

iii) Investors have homogeneous expectations of risk and return.

iv) Investors have identical time horizons.

v) Information is freely available to investors.

vi) There is a risk-free asset and investors can borrow as well as lend at the risk free rate.

vii) There are no taxes, transaction costs or other market imperfections.

viii) Total asset quantity is fixed and all assets are marketable and divisible.

4.2.3 Suitability of the Model

Although some of the assumptions are unrealistic, many authors have argued that as long as the assumptions are not greatly different from the existing market conditions, investors may behave, in aggregate, as if the assumptions are a valid description of the market. Many empirical tests have been done to test the validity of the model and found that CAPM is a quite reasonable pricing model. However, the empirical evidence has led scholars to conclude that the pure theoretical form of the CAPM does not agree well with reality. By relaxing some of the assumptions and assume that market return is directly related to the perceived risk, the market model [see Sharpe (1964)] is developed. In empirical form, the model is written as

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

where R_{it} = Rate of return of a security i

α_i = Return on zero beta asset

β_i = Systematic risk (unbiased estimate of β)

R_{mt} = Market return

ϵ_{it} = Residual

This model does provide an adequate model of the security return and is used as the framework for this research project.

CHAPTER V

SAMPLE DATA AND METHODOLOGY

5.1 *Sample Data*

5.1.1 Data Sources

The stock price data used in this research project are taken from the journal *Economic Digest* which is a Chinese title published weekly. For the dividend and stock split details, they are drawn from the Chinese title *Hong Kong Economic Journal Monthly*. The market indices, Hong Kong Index and Hang Seng Index, are taken from the *Securities Bulletin*, which is a bilingual journal. All these journals provide quite reliable and accurate data.

5.1.2 Sample Period

The sample period is from January 1, 1988 to December 31, 1991. This period is chosen because no published study on the Hong Kong stock market anomaly has yet been carried out in this period. Moreover, the sample period is after the establishment of the unified exchange, *Stock Exchange of Hong Kong*. Therefore, the Hong Kong stock market is more rationalised and irregularities in stock trading in the four different exchanges can be avoided. As a result, the study on the market is more meaningful.

5.1.3 Sample Selection

Firms are selected based on the following criteria for the analysis purpose.

1) The firm must be listed on the Stock Exchange of Hong Kong (SEHK) for the period from January 1, 1987 to December 31, 1991.
2) Weekly closing stock price of the firm must be published in the Economic Digest for the period from January 1, 1987 to December 31, 1991.
3) The firm is not suspended for trading for more than 1 week during the period from January 1, 1987 to December 31, 1991.

Seventy companies are found to satisfy the above criteria.

5.1.4 Market Index

Two market indices, namely Hong Kong Index (HKI) and Hang Seng Index (HSI), are selected for the computation of market returns. Hang Seng Index is the oldest (first published in November 1969) and the most important stock market index. It comprises 33 Hong Kong stocks which accounts for about 70% of capitalization in the Hong Kong stock market. The Hong Kong Index (founded in April 1986) is relatively new and consists of 46 stocks which accounts for over 70% of market capitalization. Both of these indices provide a good representative guide to the total capitalization of the market.

5.2 *Methodology*

5.2.1 Portfolio Construction

To investigate the relationship between stock return and firm size, five equally weighted portfolios, each of which contains seven companies, are constructed. Market capitalization is used as a measure of firm size. The portfolio construction process first involves the ranking of the seventy eligible companies (i.e. those companies which meet all the sample selection criteria in section 5.1.3) according to their average market values for the period from January 1, 1987 to December 31, 1991. The average market value of each company is calculated using the following formula.

$$\overline{MV}_i = (P_{ib}N_{ib} + P_{ie}N_{ie})/2 \tag{1}$$

where $\overline{MV}_i$ is the average market value of company i for the period

P_{ib} is the share price of company i at the beginning of the period

N_{ib} is the total number of outstanding shares of company i at the beginning of the period

P_{ie} is the share price of company i at the end of the period

N_{ie} is the total number of outstanding shares of company i at the end of the period

From the ranking of the seventy companies, the five portfolios are created based on the following criteria.

1) Each company in the largest portfolio is larger than every company in the second largest one and so on.
2) Each portfolio should contain companies in at least five different kinds of industries so as to obtain diversification and avoid bias in return.

Based on the above criteria, five portfolios, each of which consists of seven companies are constructed (refer to Appendix for a list of the companies and their average market values). Returns of the portfolios for the sample period are then computed for investigation.

5.2.2 Raw Return

Weekly returns are used in this research project for analysis purpose. The stock return of a company is calculated using the following formula:

$$R_{it} = (P_{it} - P_{it-1} + D_{it})/P_{it-1} \tag{2}$$

where R_{it} is the raw return of the stock of company i at week t

P_{it} is the closing stock price of company i at week t

D_{it} is the dividend given by company i, the ex-dividend date of which is within week t

Similarly, market return is calculated with the same method.

$$R_{mt} = (V_{it} - V_{it-1})/V_{it-1} \tag{3}$$

where R_{mt} is the market return at week t

V_{it} is the closing value of market index i at week t

It should be noted that for the two indices employed, HSI is not adjusted for dividends.

Since the portfolios constructed are equally weighted, the return of each portfolio is calculated by summing up all the company returns in the concerned portfolio.

$$R_{pt} = \sum_{i=1}^{7} R_{it} \tag{4}$$

where R_{pt} is the raw return of portfolio p at week t

R_{it} is the raw return of the stock of company i in portfolio p at week t

5.2.3 Excess Return

As mentioned before, market model is used for the estimation of the expected return of a portfolio. To calculate the expected return of a portfolio, estimation of beta or systematic risk of the concerned portfolio is needed. The portfolio beta used for calculation of expected return in a year is estimated by regressing the portfolio's weekly raw returns against the market returns in the prior year using the market model.

$$R_{pt} = \alpha_{pT} + \beta_{pT}R_{mt} + \epsilon_{pt} \qquad (5)$$

where R_{pt} is the raw return of portfolio p at week t which is in year T

α_{pT} is the return on zero beta asset estimated from year T

β_{pT} is the systematic risk or beta of portfolio p estimated from year T

R_{mt} is the market return at week t which is in year T

ϵ_{pt} is the residual

The beta estimated using this method is known as OLS (Ordinary Least Square) beta.

Excess return of a portfolio is calculated for each year using the following formula.

$$ER_{pt} = R_{pt} - (\alpha_{pT-1} + \beta_{pT-1}R_{mt}) \tag{6}$$

where ER_{pt} is the excess return of portfolio p at week t which is in year T

R_{pt} is the raw return of portfolio p at week t which is in year T

α_{pT-1} is the return on zero beta asset estimated from year T-1 using portfolio p

β_{pT-1} is the systematic risk or beta of portfolio p estimated from year T-1

R_{mt} is the market return at week t which is in year T

5.2.4 Excess Return Adjusted for Infrequent Trading

Dimson (1979)[61] suggests that there is a downward bias in estimated betas for infrequent traded shares and an upward bias for frequently traded shares when using Ordinary Least Square (OLS) technique. To account for this, Dimson beta estimates are also used for excess return computation. Dimson beta is obtained by summing the slope coefficients on the three lagged, one leading and the contemporaneous weekly market returns in the following OLS regression:

[61]Dimson, E. "Risk Measurement when Shares are Subject to Infrequent Trading." *Journal of Financial Economics*, Vol. 7 (1979), pp. 197-226.

$$R_{pt} = a_p + \sum_{k=-3}^{+1} b_{pk} R_{m,t+k} + \epsilon_{pt} \tag{7}$$

where R_{pt} is the raw return of portfolio p at week t

$R_{m,t+k}$ is the market return at week t+k

a_p is the constant term

b_{pk} is the corresponding coefficient of market return

ϵ_{pt} is the residual

Dimson betas are then used for excess return computation with formula (6).

5.2.5 Seasonality

To investigate whether the stock returns exhibit seasonality, the following dummy variable regression is used.

$$R_{pt} = \sum_{j=1}^{12} a_j D_{jt} + \epsilon_{pt} \tag{8}$$

where R_{pt} is the stock return of portfolio p at week t

D_{jt} is the dummy variable which takes the value of 1 if the return corresponds to month j and 0 otherwise

a_j is the mean return for month j

ϵ_{pt} is the residual

j represents a month i.e. 1 for January, 2 for February etc.

The regression is applied to both raw returns and excess returns to test the null hypothesis of equal mean returns across months (F-test). Moreover, the null hypothesis of zero mean return is also tested for each month (t-test). In running the regression, the intercept term is suppressed. The computer statistical package SPSS+ is used for the regression and statistical tests.

CHAPTER VI

EMPIRICAL RESULTS & ANALYSIS

6.1 *Raw Returns*

TABLE 1

RAW RETURNS OF THE FIVE PORTFOLIOS

Portfolio	Raw Return
Smallest	0.00136634
2	0.00199713
3	0.00249051
4	0.00519571
Largest	0.00505864
F-ratio[a]	F prob.[b]
0.4406	0.7793

Note : [a]F-ratio is for the test of the null hypothesis of equal raw returns across the five portfolios.
[b]F prob. is the corresponding significant probability. The null hypothesis is rejected if F prob. is less than 0.05.

FIGURE 1

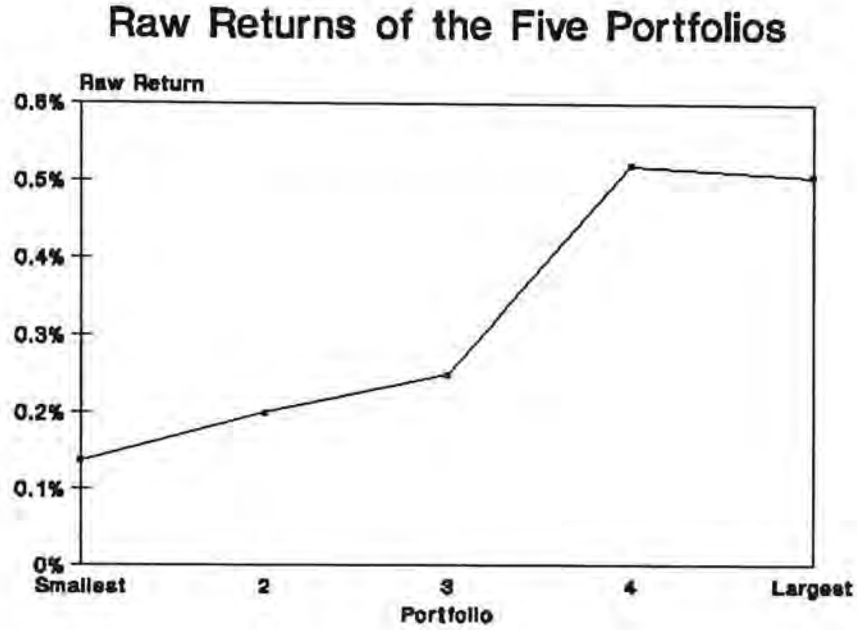

Table 1 and Figure 1 show the mean raw returns of the five portfolios. It can be seen that the raw return increases with the size of the firm. The portfolio of the smallest firms earns the lowest rate of return among the 5 portfolios. On the contrary, the 2 largest firm portfolios perform much better than the rest and each has a return of about 4 times of that of the smallest firm portfolio. This result is consistent with the findings of Pang (1988)[62], which indicates that raw return is directly related with firm size in the Hong Kong stock market. Apparently, it seems that Hong Kong exhibits a reverse firm size effect and shares of bigger firms will produce higher returns than smaller firms.

---

[62]*opcit.*

However, in testing the hypothesis that the mean raw returns are the same among the five portfolios, the F-statistic (0.4406) indicates there is a probability of 0.7793 that the means are equal. Therefore it cannot reject the null hypothesis and there is no evidence that bigger firms perform better in the Hong Kong stock market.

6.2 *Excess Returns*

As mentioned before, it has long been postulated that rate of return is a direct function of perceived risk. The higher the perceived risk, the higher is the return. Therefore, it is not logical just to compare the rate of returns between large and small firms because the different returns may be attributed to the difference in their risks. With this, it cannot test whether firm size is an important factor in determining the return of a company besides risk by just focusing on raw returns. In view of this, analysis is also carried out using the excess returns. Excess returns are the difference between the raw returns and those predicted by market model.

Table 2 presents the OLS beta of each portfolio estimated for each year. The OLS betas estimated using HKI are more or less the same as those estimated using HSI. No systematic relationship between beta and firm size can be observed. It implies that smaller firms are not necessarily more risky than larger ones though it is commonly believed that small firms are more volatile in their earning power which leads to higher risk in their shares. Furthermore, the betas are not constant throughout the period. Their values vary from year to year. Therefore, beta is not a stable variable with respect to time.

TABLE 2

ESTIMATES OF OLS BETAS

(a) Estimated from data of 1987 (used for estimation of expected returns in 1988)

Portfolio	HKI[a] γ	HKI[a] β	HSI[b] γ	HSI[b] β
Smallest	0.01374303	1.33828712	0.01461440	1.36284350
2	0.00514257	1.31185958	0.00600307	1.33927074
3	0.00317363	1.36939496	0.00407043	1.39725167
4	0.01051399	1.13147260	0.01125942	1.15682791
Largest	-0.00492167	1.15185972	-0.00414684	1.18608806

Note : [a]Hong Kong Index is used as the basis for calculation of market returns.
[b]Hang Seng Index is used as the basis for calculation of market returns.

(b) Estimated from data of 1988 (used for estimation of expected returns in 1989)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	0.00061695	1.20202138	0.00082467	1.18951175
2	0.00200523	0.69424917	0.00213038	0.68500035
3	0.00390956	1.35274391	0.00412718	1.34496876
4	0.00360117	0.85967947	0.00374815	0.85135081
Largest	0.00424296	1.10454510	0.00438891	1.11059302

(c) Estimated from data of 1989 (used for estimation of expected returns in 1990)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	-0.00330534	1.37854472	-0.00343346	1.38490252
2	-0.00249423	1.36379835	-0.00261584	1.36720290
3	-0.00006470	1.43197681	-0.00019101	1.43477896
4	0.00364537	1.16626064	0.00354683	1.16610503
Largest	0.00176807	1.11847478	0.00165864	1.12671792

(d) Estimated from data of 1990 (used for estimation of expected returns in 1991)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	0.00089400	1.36970977	0.00088490	1.35947372
2	-0.00032260	0.97625321	-0.00032531	0.96692049
3	-0.00459311	1.11679639	-0.00460353	1.11007150
4	-0.00124087	0.88660121	-0.00125168	0.88263231
Largest	0.00094379	1.10948118	0.00091641	1.11199015

TABLE 3

EXCESS RETURNS OF THE FIVE PORTFOLIOS
BASED ON OLS BETAS

	HKI[a]	HSI[b]
Smallest Portfolio	-0.00592462	-0.00616808
(t-value)[c]	(-3.07)	(-3.14)
[2-tailed prob.][d]	[0.002]	[0.002]
Portfolio 2	-0.00248689	-0.00269655
(t-value)	(-1.28)	(-1.37)
[2-tailed prob.]	[0.201]	[0.173]
Portfolio 3	-0.00208376	-0.00234214
(t-value)	(-1.41)	(-1.56)
[2-tailed prob.]	[0.159]	[0.121]
Portfolio 4	-0.00205858	-0.00226185
(t-value)	(-1.35)	(-1.46)
[2-tailed prob.]	[0.179]	[0.147]
Largest Portfolio	0.00102931	0.00079085
(t-value)	(1.28)	(1.00)
[2-tailed prob.]	[0.202]	[0.320]
F-ratio[e]	2.4087	2.3391
F prob.[f]	0.0477	0.0535

Note : [a]Hong Kong Index is used as the basis for calculation of market returns.
[b]Hang Seng Index is used as the basis for calculation of market returns.
[c]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio.
[d]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.
[e]F-ratio is for the test of the null hypothesis of equal excess returns across the five portfolios.
[f]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

FIGURE 2

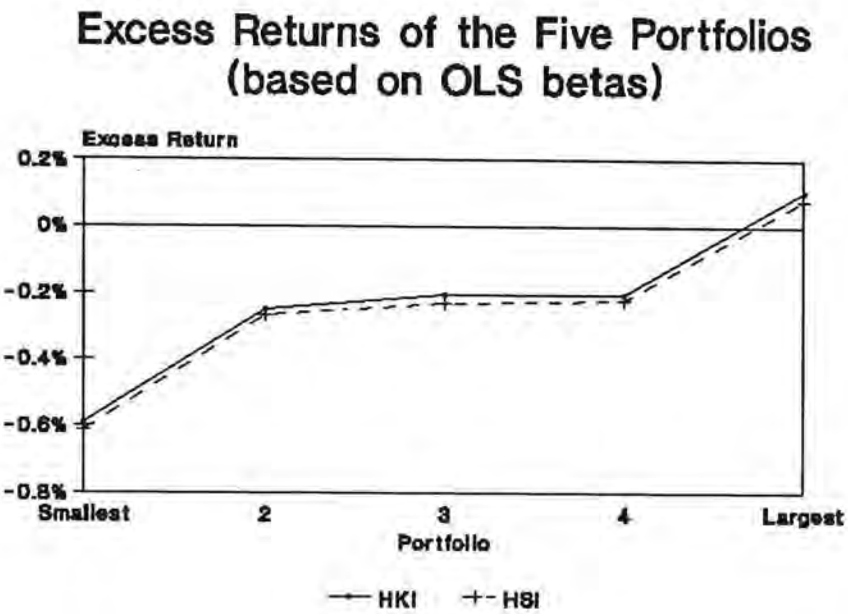

Table 3 and Figure 2 summarize the results by using OLS beta as a measure of systematic risk. The returns are also calculated using different market indices (HKI and HSI) for computing market returns. It can be observed that no matter whether using HKI or HSI for calculation of market returns, the portfolio of the smallest firms produce the lowest excess returns while the largest firm portfolio earn the highest ones. Moreover, only the largest firm portfolio has a positive excess return and the mean excess return becomes less negative as the firm size increases. This result is consistent with that of raw returns which indicates the largest firm portfolio performs the best. It may be due to the fact that small firms are more volatile in their market shares and earnings, which lead to their frequent poor performance. However, it contradicts Pang's findings which indicate that risk adjusted returns do not exhibit the reverse firm size effect in the Hong Kong stock market.

In testing the hypothesis of equal means of excess returns across the five portfolios, the results are different when using different indices to calculate the market returns. F-statistics show that it can reject the null hypothesis at 5% significant level when using HKI but it cannot when using HSI. This indicates that different results may be obtained in using different indices as representative of market return. However, the results are quite marginal since both the two statistics are close to the decision point (probability of 0.0477 vs 0.0530). Therefore, although it does not give a strong evidence that the excess returns are different among the five portfolios, it does provide an indication of such possibility.

In testing the mean of excess returns of each portfolio, t-statistics show that the mean of the smallest firm portfolio is significantly different from zero at 5% level while the means of the remaining four portfolios are not significantly different from zero. In closer examination, it can be found that the smallest firm portfolio actually produces a mean which is significantly less than zero. The same result is obtained no matter whether using HKI or HSI for computation of market returns. It may conclude that a reverse firm size effect is observed in the Hong Kong stock market. Smaller firms under-perform larger firms and earn negative excess returns (i.e. returns less than expected ones based on market models).

6.3 *Excess Returns Adjusted for Infrequent Trading*

The reverse firm size effect found above may be due to improperly measured risk. As mentioned before, Dimson (1979)[63] argues that there is a downward bias in estimated betas for infrequent traded shares and an upward bias for frequently traded shares. Hence, estimation of excess returns using betas without taking into account of trading infrequency may lead to the observed reverse firm size effect. In view of this, Dimson betas are estimated for the five portfolios and excess returns based on the Dimson betas are also investigated.

TABLE 4

ESTIMATES OF DIMSON BETAS

(a) Estimated from data of 1987 (used for estimation of expected returns in 1988)

Portfolio	HKI[a] γ	HKI[a] β	HSI[b] γ	HSI[b] β
Smallest	0.01833266	1.55860115	0.01961717	1.58661268
2	0.00950361	1.41987093	0.01075488	1.44992032
3	0.00789635	1.30192993	0.00904940	1.32949170
4	0.01124644	1.09422731	0.01218506	1.11185291
Largest	-0.00735445	0.90899298	-0.00647358	0.93118422

Note : [a]Hong Kong Index is used as the basis for calculation of market returns.
[b]Hang Seng Index is used as the basis for calculation of market returns.

[63]*opcit.*

(b) Estimated from data of 1988 (used for estimation of expected returns in 1989)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	0.00105862	1.25143919	0.00134250	1.22725603
2	0.00019880	1.06291607	0.00037855	1.05759973
3	0.00440557	1.31034694	0.00463942	1.29964957
4	0.00258624	1.14954648	0.00274178	1.15046816
Largest	0.00418566	1.16746004	0.00440093	1.16410412

(c) Estimated from data of 1989 (used for estimation of expected returns in 1990)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	-0.00276870	1.04165726	-0.00285758	1.04172276
2	-0.00211771	1.02774197	-0.00220273	1.02303179
3	0.00046165	1.11692660	0.00036715	1.11416300
4	0.00395699	0.91628097	0.00387828	0.91496450
Largest	0.00174728	1.04161149	0.00165804	1.04393877

(d) Estimated from data of 1990 (used for estimation of expected returns in 1991)

Portfolio	HKI γ	HKI β	HSI γ	HSI β
Smallest	0.00127741	1.26707526	0.00122772	1.27941506
2	-0.00072939	1.14638028	-0.00075797	1.14605369
3	-0.00409507	0.84643118	-0.00411081	0.85034571
4	-0.00141926	0.95336375	-0.00145229	0.95915368
Largest	0.00077520	1.16978948	0.00074055	1.17816070

TABLE 5

EXCESS RETURNS OF THE FIVE PORTFOLIOS
BASED ON DIMSON BETAS

	HKI[a]	HSI[b]
Smallest Portfolio	-0.00577834	-0.00604189
(t-value)[c]	(-2.95)	(-3.03)
[2-tailed prob.][d]	[0.004]	[0.003]
Portfolio 2	-0.00283633	-0.00306554
(t-value)	(-1.59)	(-1.69)
[2-tailed prob.]	[0.113]	[0.093]
Portfolio 3	-0.00144198	-0.00170856
(t-value)	(-1.01)	(-1.17)
[2-tailed prob.]	[0.314]	[0.242]
Portfolio 4	-0.00214842	-0.00237354
(t-value)	(-1.49)	(-1.62)
[2-tailed prob.]	[0.137]	[0.106]
Largest Portfolio	0.00110772	0.00086339
(t-value)	(1.31)	(1.04)
[2-tailed prob.]	[0.191]	[0.299]
F-ratio[e]	2.6084	2.5356
F prob.[f]	0.0343	0.0387

Note : [a]Hong Kong Index is used as the basis for calculation of market returns.
[b]Hang Seng Index is used as the basis for calculation of market returns.
[c]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio.
[d]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.
[e]F-ratio is for the test of the null hypothesis of equal excess returns across the five portfolios.
[f]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

FIGURE 3

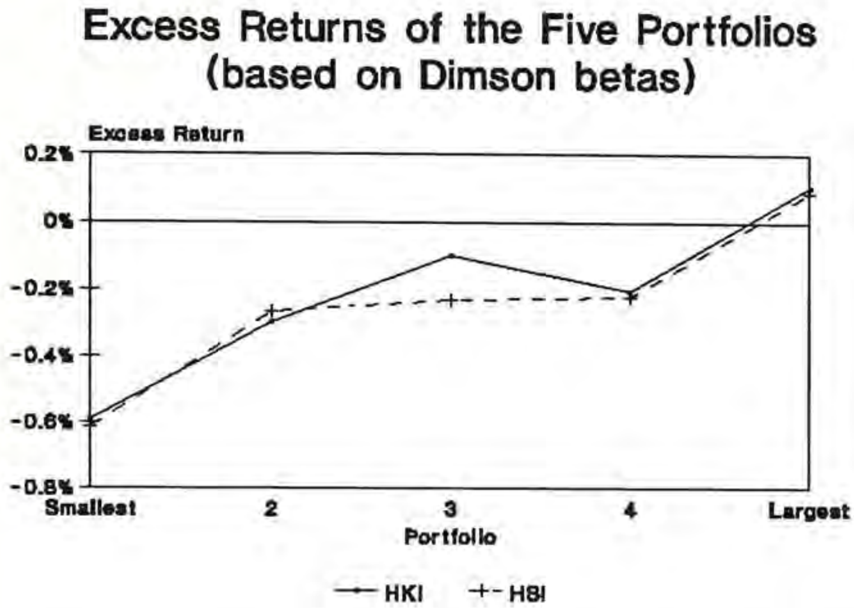

Table 2 and Table 4 show the OLS and Dimson betas respectively. It can be observed that the two betas are generally different from each other and the difference can be as large as 30% in some cases. This is not surprising because some shares are indeed infrequently traded in the Hong Kong stock market.

Table 5 and Figure 3 summarize the results using Dimson betas. It can be shown that results similar to those using OLS betas are obtained. The portfolio of the smallest firms produce the lowest excess returns while the largest firm portfolio earn the highest ones. Besides, the largest firm portfolio out-performs others and is the only portfolio which generates a positive excess return. All the remaining four portfolios generate negative excess returns and the mean excess return becomes less negative as the firm size increases.

In performing F-test, the F-statistics show that it can reject the null hypothesis of equal means of excess returns across the five portfolios at 5% significant level.

In contrast to the results using OLS betas, the rejection is valid in using both HKI and HSI. Hence, it can conclude that excess returns are different among the five portfolios and dependent on firm size.

In testing the hypothesis of zero mean in excess returns, t-statistics show that the mean of the smallest firm portfolio is significantly different from zero at 5% level while the means of the remaining four portfolios are not. Similar to the case of using OLS betas, the smallest firm portfolio indeed produces a mean which is significantly less than zero. The same results are obtained for both cases using HKI and HSI. These results suggest that even after the Dimson adjustment for infrequent trading, a reverse firm size effect is still observed in the Hong Kong stock market.

6.4 *Seasonality*

Many studies have found that size effect is strongly related to the seasonality. Therefore, the month-to-month stability of the reverse size anomaly is also examined.

6.4.1 Raw Returns

Table 6 summarizes the mean raw returns of each portfolio for each month. The mean raw returns are found using the regression techniques discussed in the Methodology chapter. In testing the hypothesis of equal mean raw returns across months, the F statistics indicate that the null hypothesis cannot be rejected for all portfolios. It implies that the Hong Kong stock market does not exhibit seasonality. These results are inconsistent with Pang's findings which demonstrate that raw returns are significantly higher in January, April, October and March.

TABLE 6

REGRESSION RESULTS OF RAW RETURNS

	Smallest	Portfolio 2	Portfolio 3	Portfolio 4	Largest
January	0.003376	0.004926	0.006122	0.008024	0.005460
(t-value)[a]	(0.3150)	(0.5320)	(0.6040)	(0.9340)	(0.6940)
[2-tailed prob.][b]	[0.7535]	[0.5951]	[0.5464]	[0.3517]	[0.4886]
February	0.018340	0.020160*	0.017670	0.017080	0.012880
(t-value)	(1.6580)	(2.1140)*	(1.6910)	(1.9270)	(1.5890)
[2-tailed prob.]	[0.0990]	[0.0358]*	[0.0923]	[0.0554]	[0.1138]
March	0.010640	0.012350	0.007214	0.009426	0.010800
(t-value)	(1.0470)	(1.4110)	(0.7530)	(1.1590)	(1.4510)
[2-tailed prob.]	[0.2962]	[0.1600]	[0.4525]	[0.2477]	[0.1483]
April	0.008218	0.000758	0.001471	0.006362	0.007317
(t-value)	(0.7650)	(0.0820)	(0.1450)	(0.7400)	(0.9300)
[2-tailed prob.]	[0.4449]	[0.9348]	[0.8848]	[0.4601]	[0.3536]
May	-0.010910	-0.013450	-0.012110	-0.008518	0.002660
(t-value)	(-1.0160)	(-1.4540)	(-1.1960)	(-0.9910)	(0.3380)
[2-tailed prob.]	[0.3107]	[0.1476]	[0.2333]	[0.3229]	[0.7357]
June	0.007562	0.001577	-0.001078	0.003907	0.001116
(t-value)	(0.7250)	(0.1750)	(-0.1090)	(0.4680)	(0.1460)
[2-tailed prob.]	[0.4694]	[0.8610]	[0.9129]	[0.6405]	[0.8841]
July	0.015600	0.019300*	0.014300	0.016010	0.015600*
(t-value)	(1.4530)	(2.0860)*	(1.4110)	(1.8630)	(1.9820)*
[2-tailed prob.]	[0.1478]	[0.0383]*	[0.1597]	[0.0640]	[0.0488]*
August	-0.026340*	-0.016550	-0.015640	-0.008940	-0.014710
(t-value)	(-2.5250)*	(-1.8400)	(-1.5880)	(-1.0700)	(-1.9240)
[2-tailed prob.]	[0.0124]*	[0.0672]	[0.1139]	[0.2858]	[0.0559]
September	-0.008456	-0.005801	-0.004425	0.004630	0.000459
(t-value)	(-0.8110)	(-0.6450)	(-0.4490)	(0.5540)	(0.0600)
[2-tailed prob.]	[0.4186]	[0.5196]	[0.6537]	[0.5800]	[0.9522]
October	0.009489	0.004690	0.009683	0.010880	0.013880
(t-value)	(0.8570)	(0.4920)	(0.9270)	(1.2280)	(1.7110)
[2-tailed prob.]	[0.3922]	[0.6234]	[0.3550]	[0.2208]	[0.0887]
November	-0.000381	0.004110	0.007189	0.002893	0.004084
(t-value)	(-0.0360)	(0.4570)	(0.7300)	(0.3460)	(0.5340)
[2-tailed prob.]	[0.9709]	[0.6481]	[0.4662]	[0.7295]	[0.5939]
December	-0.007862	-0.006164	0.001707	0.002374	0.003284
(t-value)	(-0.7540)	(-0.6850)	(0.1730)	(0.2840)	(0.4290)
[2-tailed prob.]	[0.4520]	[0.4938]	[0.8625]	[0.7766]	[0.6681]
F-ratio[c]	1.37812	1.49732	0.94943	1.19259	1.42845
F prob.[d]	0.1788	0.1275	0.4988	0.2905	0.1554
R^2	0.07745	0.08358	0.05467	0.06773	0.08005

Note : [a]t-value in parentheses is for the test of the null hypothesis of zero mean raw return for the tested portfolio in the concerned month.

[b]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.

[c]F-ratio is for the test of the null hypothesis of equal mean raw returns across months for the tested portfolio.

[d]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

*Rejected

6.4.2 Excess Returns

Excess returns are also investigated to see whether they exhibit seasonality. Table 7 and 8 present the mean excess returns of each portfolio for each month using the two different stock market indices. In both cases, the F-statistics cannot reject the hypothesis of equal excess returns across months. Hence, excess returns do not demonstrate seasonality for all portfolios.

In testing the hypothesis of zero mean in excess returns for each month, the t-statistics show that the mean excess returns are significantly different from zero in December for the smallest firm portfolio and in May for the largest firm portfolio. The same results are obtained no matter whether using HKI or HSI for computation of market returns. With closer examination, it can be noted that the mean excess return of the smallest portfolio is significantly smaller than zero in December while that of the largest portfolio is significantly greater than zero in May. Recalling that the smallest firm portfolio has been observed to have a significantly less than zero mean excess return, it can be concluded that this effect, to a certain extent, is more pronounced in December although F-test cannot reject the hypothesis of equal mean excess returns across months.

When the above test is carried out using HSI for calculation of market returns, the mean excess return of the smallest firm portfolio is also found to be significantly smaller than zero in August.

TABLE 7

REGRESSION RESULTS OF EXCESS RETURNS (USING OLS BETAS AND HKI)

	Smallest	Portfolio 2	Portfolio 3	Portfolio 4	Largest
January	-0.010200	-0.002339	-0.004654	-0.003222	-0.003585
(t-value)[a]	(-1.5050)	(-0.3420)	(-0.8840)	(-0.5930)	(-1.2890)
[2-tailed prob.][b]	[0.1339]	[0.7327]	[0.3776]	[0.5542]	[0.1988]
February	0.000574	0.008161	0.002905	0.002401	-0.000042
(t-value)	(0.0820)	(1.1580)	(0.5350)	(0.4280)	(-0.0150)
[2-tailed prob.]	[0.9346]	[0.2484]	[0.5929]	[0.6689]	[0.9883]
March	-0.001461	0.002582	-0.001876	-0.001752	0.002207
(t-value)	(-0.2280)	(0.3990)	(-0.3770)	(-0.3410)	(0.8390)
[2-tailed prob.]	[0.8200]	[0.6902]	[0.7066]	[0.7338]	[0.4025]
April	0.001391	-0.003394	-0.003334	-0.001035	0.004082
(t-value)	(0.2050)	(-0.4960)	(-0.6340)	(-0.1900)	(1.4680)
[2-tailed prob.]	[0.8376]	[0.6202]	[0.5271]	[0.8492]	[0.1437]
May	-0.007305	-0.010790	-0.004642	-0.007518	0.008341*
(t-value)	(-1.0780)	(-1.5770)	(-0.8820)	(-1.3820)	(3.0000)*
[2-tailed prob.]	[0.2824]	[0.1163]	[0.3789]	[0.1684]	[0.0031]*
June	0.006770	-0.002767	0.000918	-0.000431	0.002737
(t-value)	(1.0280)	(-0.4160)	(0.1790)	(-0.0820)	(1.0130)
[2-tailed prob.]	[0.3053]	[0.6776]	[0.8578]	[0.9350]	[0.3124]
July	-0.007941	0.003579	-0.006066	-0.002788	-0.001523
(t-value)	(-1.1720)	(0.5230)	(-1.1520)	(-0.5130)	(-0.5480)
[2-tailed prob.]	[0.2427]	[0.6014]	[0.2505]	[0.6087]	[0.5844]
August	-0.012970	-0.001965	0.000368	0.000537	-0.002084
(t-value)	(-1.9690)	(-0.2960)	(0.0720)	(0.1020)	(-0.7710)
[2-tailed prob.]	[0.0503]	[0.7678]	[0.9428]	[0.9192]	[0.4416]
September	-0.007698	-0.000762	-0.001798	0.004318	0.002833
(t-value)	(-1.1690)	(-0.1150)	(-0.3520)	(0.8170)	(1.0480)
[2-tailed prob.]	[0.2439]	[0.9089]	[0.7256]	[0.4148]	[0.2957]
October	-0.006289	-0.009835	-0.003748	-0.004257	0.002972
(t-value)	(-0.9000)	(-1.3950)	(-0.6910)	(-0.7590)	(1.0370)
[2-tailed prob.]	[0.3691]	[0.1646]	[0.4905]	[0.4485]	[0.3011]
November	-0.008782	-0.000150	0.001275	-0.004764	-0.001716
(t-value)	(-1.3330)	(-0.0230)	(0.2490)	(-0.9020)	(-0.6350)
[2-tailed prob.]	[0.1840]	[0.9821]	[0.8034]	[0.3684]	[0.5262]
December	-0.016770*	-0.012240	-0.004571	-0.006308	-0.001661
(t-value)	(-2.5460)*	(-1.8420)	(-0.8940)	(-1.1940)	(-0.6140)
[2-tailed prob.]	[0.0117]*	[0.0670]	[0.3726]	[0.2341]	[0.5396]
F-ratio[c]	1.68945	0.85324	0.43472	0.52998	1.53284
F prob.[d]	0.0714	0.5956	0.9480	0.8936	0.1149
R^2	0.09331	0.04941	0.02580	0.03127	0.08540

Note : [a]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio in the concerned month.

[b]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.

[c]F-ratio is for the test of the null hypothesis of equal mean excess returns across months for the tested portfolio.

[d]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

*Rejected

TABLE 8

REGRESSION RESULTS OF EXCESS RETURNS (USING OLS BETAS AND HSI)

	Smallest	Portfolio 2	Portfolio 3	Portfolio 4	Largest
January	-0.010570	-0.002684	-0.005087	-0.003560	-0.004038
(t-value)[a]	(-1.5360)	(-0.3860)	(-0.9480)	(-0.6430)	(-1.4760)
[2-tailed prob.][b]	[0.1262]	[0.6997]	[0.3445]	[0.5208]	[0.1416]
February	0.000960	0.008438	0.003283	0.002674	0.000194
(t-value)	(0.1350)	(1.1780)	(0.5930)	(0.4690)	(0.0690)
[2-tailed prob.]	[0.8925]	[0.2402]	[0.5537]	[0.6398]	[0.9453]
March	-0.001523	0.002504	-0.001911	-0.001816	0.002114
(t-value)	(-0.2340)	(0.3810)	(-0.3760)	(-0.3470)	(0.8170)
[2-tailed prob.]	[0.8152]	[0.7036]	[0.7071]	[0.7290]	[0.4150]
April	0.001323	-0.003411	-0.003441	-0.001086	0.003977
(t-value)	(0.1920)	(-0.4910)	(-0.6410)	(-0.1960)	(1.4530)
[2-tailed prob.]	[0.8478]	[0.6240]	[0.5222]	[0.8447]	[0.1477]
May	-0.007590	-0.010950	-0.004885	-0.007694	0.008223*
(t-value)	(-1.1030)	(-1.5760)	(-0.9100)	(-1.3900)	(3.0050)*
[2-tailed prob.]	[0.2714]	[0.1165]	[0.3640]	[0.1661]	[0.0030]*
June	0.006395	-0.003087	0.000584	-0.000718	0.002526
(t-value)	(0.9560)	(-0.4570)	(0.1120)	(-0.1330)	(0.9500)
[2-tailed prob.]	[0.3401]	[0.6481]	[0.9110]	[0.8940]	[0.3433]
July	-0.007898	0.003609	-0.006085	-0.002784	-0.001671
(t-value)	(-1.1480)	(0.5190)	(-1.1330)	(-0.5030)	(-0.6110)
[2-tailed prob.]	[0.2525]	[0.6041]	[0.2584]	[0.6155]	[0.5422]
August	-0.013350*	-0.002303	-0.000020	0.000223	-0.002308
(t-value)	(-1.9950)*	(-0.3410)	(-0.0040)	(0.0410)	(-0.8680)
[2-tailed prob.]	[0.0474]*	[0.7335]	[0.9969]	[0.9670]	[0.3866]
September	-0.008132	-0.001185	-0.002282	0.003926	0.002415
(t-value)	(-1.2160)	(-0.1760)	(-0.4370)	(0.7300)	(0.9080)
[2-tailed prob.]	[0.2255]	[0.8608]	[0.6623]	[0.4663]	[0.3649]
October	-0.006808	-0.010270	-0.004253	-0.004648	0.002485
(t-value)	(-0.9600)	(-1.4330)	(-0.7690)	(-0.8150)	(0.8810)
[2-tailed prob.]	[0.3383]	[0.1534]	[0.4431]	[0.4162]	[0.3794]
November	-0.009063	-0.000402	0.000967	-0.005012	-0.002030
(t-value)	(-1.3550)	(-0.0600)	(0.1850)	(-0.9320)	(-0.7630)
[2-tailed prob.]	[0.1769]	[0.9525]	[0.8531]	[0.3525]	[0.4461]
December	-0.017310*	-0.012660	-0.005151	-0.006726	-0.002164
(t-value)	(-2.5880)*	(-1.8740)	(-0.9870)	(-1.2510)	(-0.8140)
[2-tailed prob.]	[0.0104]*	[0.0624]	[0.3247]	[0.2126]	[0.4167]
F-ratio[c]	1.73590	0.88364	0.47658	0.55221	1.57239
F prob.[d]	0.0617	0.5646	0.9268	0.8779	0.1021
R^2	0.09563	0.05108	.02821	0.03254	0.08741

Note : [a]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio in the concerned month.

[b]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.

[c]F-ratio is for the test of the null hypothesis of equal mean excess returns across months for the tested portfolio.

[d]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

*Rejected

6.4.3 Excess Returns Adjusted for Infrequent Trading

Analysis is also carried out to investigate whether the excess returns after adjusting for infrequent trading demonstrate seasonality. The results are presented in Table 9 and 10.

For both cases using the two different indices, the F-statistics indicate that the mean excess returns are not significantly different from zero across months for all portfolio except the largest firm portfolio. This implies that the excess returns of the largest portfolio exhibit seasonality after adjusting for infrequent trading. May appears to be the month which has the highest excess return.

From the results of t-tests, the t-statistics show that the mean excess returns are significantly different from zero in August as well as December for the smallest firm portfolio and in May for the largest firm portfolio. The mean excess return of the smallest portfolio is significantly smaller than zero in the corresponding months while that of the largest portfolio is significantly greater than zero. Besides, the second smallest portfolio also has a mean excess return significantly different from zero in December. The results are consistent with those using OLS betas. Hence, it can be concluded that small firms earn significantly less than zero mean excess returns after adjusting for infrequent trading and this effect, to a certain extent, is more pronounced in August and December. In addition, excess returns using Dimson betas exhibit seasonality and large firms earn significantly larger than zero excess returns in May after accounting for infrequent trading.

TABLE 9

REGRESSION RESULTS OF EXCESS RETURNS (USING DIMSON BETAS AND HKI)

	Smallest	Portfolio 2	Portfolio 3	Portfolio 4	Largest
January	-0.010830	-0.005471	-0.004007	-0.005369	-0.004025
(t-value)[a]	(-1.5780)	(-0.8690)	(-0.7860)	(-1.0480)	(-1.3920)
[2-tailed prob.][b]	[0.1161]	[0.3860]	[0.4331]	[0.2957]	[0.1655]
February	0.001978	0.006980	0.005328	0.001731	-0.000447
(t-value)	(0.2800)	(1.0750)	(1.0130)	(0.3280)	(-0.1500)
[2-tailed prob.]	[0.7800]	[0.2835]	[0.3121]	[0.7433]	[0.8808]
March	-0.000902	0.002915	-0.000082	-0.000926	0.002886
(t-value)	(-0.1390)	(0.4890)	(-0.0170)	(-0.1910)	(1.0550)
[2-tailed prob.]	[0.8896]	[0.6250]	[0.9864]	[0.8486]	[0.2927]
April	0.000427	-0.004203	-0.003638	-0.001460	0.004702
(t-value)	(0.0620)	(-0.6670)	(-0.7130)	(-0.2850)	(1.6260)
[2-tailed prob.]	[0.9505]	[0.5053]	[0.4766]	[0.7758]	[0.1055]
May	-0.005965	-0.007942	-0.004230	-0.005432	0.008337*
(t-value)	(-0.8700)	(-1.2610)	(-0.8290)	(-1.0610)	(2.8830)*
[2-tailed prob.]	[0.3856]	[0.2087]	[0.4080]	[0.2901]	[0.0044]*
June	0.007605	0.001878	0.001871	0.003644	0.004723
(t-value)	(1.1410)	(0.3070)	(0.3770)	(0.7320)	(1.6810)
[2-tailed prob.]	[0.2554]	[0.7592]	[0.7063]	[0.4649]	[0.0944]
July	-0.006240	0.001614	-0.003082	-0.004079	-0.002127
(t-value)	(-0.9100)	(0.2560)	(-0.6040)	(-0.7970)	(-0.7360)
[2-tailed prob.]	[0.3641]	[0.7979]	[0.5464]	[0.4267]	[0.4628]
August	-0.014120*	-0.003442	-0.002087	-0.001136	-0.003664
(t-value)	(-2.1180)*	(-0.5630)	(-0.4210)	(-0.2280)	(-1.3040)
[2-tailed prob.]	[0.0354]*	[0.5744]	[0.6742]	[0.8196]	[0.1938]
September	-0.009945	-0.004499	-0.003771	0.001329	0.001931
(t-value)	(-1.4920)	(-0.7350)	(-0.7610)	(0.2670)	(0.6870)
[2-tailed prob.]	[0.1374]	[0.4630]	[0.4478]	[0.7898]	[0.4927]
October	-0.004978	-0.007505	-0.001413	-0.001942	0.004630
(t-value)	(-0.7040)	(-1.1560)	(-0.2690)	(-0.3680)	(1.5530)
[2-tailed prob.]	[0.4823]	[0.2489]	[0.7884]	[0.7133]	[0.1219]
November	-0.009402	-0.002253	0.001629	-0.006119	-0.001943
(t-value)	(-1.4100)	(-0.3680)	(0.3290)	(-1.2300)	(-0.6910)
[2-tailed prob.]	[0.1600]	[0.7131]	[0.7428]	[0.2203]	[0.4901]
December	-0.016260*	-0.012120*	-0.003652	-0.006066	-0.001453
(t-value)	(-2.4380)*	(-1.9800)*	(-0.7370)	(-1.2190)	(-0.5170)
[2-tailed prob.]	[0.0156]*	[0.0491]*	[0.4621]	[0.2244]	[0.6056]
F-ratio[c]	1.71836	0.88312	0.40224	0.57302	1.89403*
F prob.[d]	0.0652	0.5651	0.9616	0.8623	0.0370*
R^2	0.09475	0.05105	.02392	.03373	0.10344

Note : [a]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio in the concerned month.

[b]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.

[c]F-ratio is for the test of the null hypothesis of equal mean excess returns across months for the tested portfolio.

[d]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

*Rejected

TABLE 10

REGRESSION RESULTS OF EXCESS RETURNS (USING DIMSON BETAS AND HSI)

	Smallest	Portfolio 2	Portfolio 3	Portfolio 4	Largest
January	-0.011240	-0.005915	-0.004458	-0.005798	-0.004418
(t-value)[a]	(-1.6090)	(-0.9230)	(-0.8580)	(-1.1140)	(-1.5580)
[2-tailed prob.][b]	[0.1092]	[0.3570]	[0.3921]	[0.2667]	[0.1209]
February	0.002361	0.007330	0.005649	0.001980	-0.000229
(t-value)	(0.3280)	(1.1100)	(1.0540)	(0.3690)	(-0.0780)
[2-tailed prob.]	[0.7433]	[0.2683]	[0.2931]	[0.7126]	[0.9376]
March	-0.001088	0.002820	-0.000169	-0.000982	0.002789
(t-value)	(-0.1650)	(0.4650)	(-0.0340)	(-0.1990)	(1.0390)
[2-tailed prob.]	[0.8693]	[0.6421]	[0.9726]	[0.8421]	[0.2999]
April	0.000502	-0.004203	-0.003724	-0.001525	0.004572
(t-value)	(0.0720)	(-0.6560)	(-0.7160)	(-0.2930)	(1.6120)
[2-tailed prob.]	[0.9428]	[0.5125]	[0.4746]	[0.7698]	[0.1086]
May	-0.006266	-0.008075	-0.004464	-0.005595	0.008079*
(t-value)	(-0.8970)	(-1.2600)	(-0.8590)	(-1.0750)	(2.8490)*
[2-tailed prob.]	[0.3708]	[0.2090]	[0.3916]	[0.2838]	[0.0049]*
June	0.007123	0.001607	0.001519	0.003478	0.004485
(t-value)	(1.0490)	(0.2580)	(0.3010)	(0.6870)	(1.6270)
[2-tailed prob.]	[0.2952]	[0.7966]	[0.7640]	[0.4927]	[0.1053]
July	-0.006287	0.001557	-0.003178	-0.004220	-0.002228
(t-value)	(-0.9000)	(0.2430)	(-0.6110)	(-0.8110)	(-0.7850)
[2-tailed prob.]	[0.3691]	[0.8082]	[0.5416]	[0.4186]	[0.4331]
August	-0.014510*	-0.003813	-0.002466	-0.001470	-0.003948
(t-value)	(-2.1380)*	(-0.6120)	(-0.4880)	(-0.2910)	(-1.4320)
[2-tailed prob.]	[0.0338]*	[0.5410]	[0.6260]	[0.7717]	[0.1537]
September	-0.010360	-0.004999	-0.004238	0.000893	0.001558
(t-value)	(-1.5260)	(-0.8030)	(-0.8390)	(0.1760)	(0.5650)
[2-tailed prob.]	[0.1287]	[0.4230]	[0.4025]	[0.8601]	[0.5727]
October	-0.005493	-0.007920	-0.001873	-0.002302	0.004192
(t-value)	(-0.7630)	(-1.1990)	(-0.3500)	(-0.4290)	(1.4340)
[2-tailed prob.]	[0.4464]	[0.2319]	[0.7270]	[0.6684]	[0.1532]
November	-0.009700	-0.002556	0.001321	-0.006412	-0.002248
(t-value)	(-1.4290)	(-0.4110)	(0.2620)	(-1.2670)	(-0.8160)
[2-tailed prob.]	[0.1546]	[0.6818]	[0.7939]	[0.2065]	[0.4157]
December	-0.016780*	-0.012580*	-0.004207	-0.006538	-0.001960
(t-value)	(-2.4720)*	(-2.0200)*	(-0.8330)	(-1.2920)	(-0.7110)
[2-tailed prob.]	[0.0143]*	[0.0448]*	[0.4061]	[0.1977]	[0.4779]
F-ratio[c]	1.75677	0.92937	0.44907	0.61358	1.92390*
F prob.[d]	0.0577	0.5186	0.9412	0.8293	0.0335*
R^2	0.09667	0.05358	0.02663	0.03603	0.10490

Note : [a]t-value in parentheses is for the test of the null hypothesis of zero mean excess return for the tested portfolio in the concerned month.

[b]2-tailed prob. in square brackets is the corresponding significant probability of t-test. The null hypothesis is rejected if the 2-tailed prob. is less than 0.05.

[c]F-ratio is for the test of the null hypothesis of equal mean excess returns across months for the tested portfolio.

[d]F prob. is the corresponding significant probability of F-test. The null hypothesis is rejected if F prob. is less than 0.05.

*Rejected

CHAPTER VII

IMPLICATION OF FINDINGS AND CONCLUSION

Based on the findings, it appears that there is a reverse firm size effect in the Hong Kong stock market. Smaller firms under-perform larger firms and earn significantly negative excess returns (i.e. returns less than expected ones based on market models) even after adjusting for risk and infrequent trading. Although no seasonality is observed in the Hong Kong stock market, the reverse firm size effect, to a certain extent, is more pronounced in August and December.

The above findings contradict, to some degree, Pang's (1988)[64] findings in her earlier study of the Hong Kong stock market. She finds that raw returns demonstrate significant seasonality and a reverse firm size effect, which is consistent with the findings in this research project. However, after adjusting for risk, she finds that the market wide stock return seasonality is removed and there may be a small firm effect which is not the case in this study. The difference between the findings may be due to the different time frames and methods of return calculation employed. Pang investigates the Hong Kong stock market for the period 1977-1986, during which shares were traded in four different exchanges. However, this research project

---

[64] *opcit.*

focuses on the period 1988-1991 after the establishment of The Stock Exchange of Hong Kong. Hence, the phenomenon observed in Pang's study may be due to irregularities in stock trading in the four different exchanges. Moreover, monthly returns are used in Pang's studies while weekly returns are used in this research project. As mentioned before, estimated beta is sensitive to the length of the return interval used. Therefore, the difference between the two studies in findings concerning risk-adjusted returns may be due to bias in beta estimates.

The reverse firm size effect observed may reveal some degree of inefficiency of the Hong Kong stock market. In fact, Dawson (1982)[65], Law (1982)[66] as well as Wong and Kwong (1984)[67] examine the Hong Kong stock market and suggest that it is inefficient because of its speculative nature. The difference in findings of the Hong Kong stock market behaviour as shown in Pang's studies and this research project may further enhance this point.

Although the reverse firm size effect observed in the Hong Kong stock market is different from the size anomaly found in other stock markets, the two anomalies are both related to the size. Therefore, there is a possibility that the present market model has misspecified size as a variable besides risk that affects return.

---

[65]*opcit.*

[66]*opcit.*

[67]*opcit.*

Another possibility is that firm size effect is a statistical artifact since a totally opposite firm size anomalies are found in Hong Kong. This suggests that the phenomenon may be an artificial one due to defects in research techniques, bias in estimation of variables or other unknown reasons. Further research should be carried out in order to uncover the size mystery.

APPENDIX 1

LIST OF COMPANIES OF THE FIVE PORTFOLIOS

	Business Type
Smallest Portfolio	
Burwill Holdings Ltd.	Con. Enterprise
Chuang's Consortium International Ltd.	Con. Enterprise
Far East Hotels & Entertainment Ltd.	Hotel
Chung Wah Shipbuilding & Engineering (Holdings) Co. Ltd.	Transport
Far East Consortium International Ltd.	Property
Crocodile Garments Ltd.	Department Store
Wong's International (Holdings) Ltd.	Industry
Portfolio 2	
Chevalier International Holdings Ltd.	Con. Enterprise
Lam Soon (HK) Ltd.	Con. Enterprise
Lane Crawford International Ltd. 'A'	Department Store
Furama Hotel Enterprises Ltd.	Hotel
China Entertainment & Land Investment Holdings Ltd.	Property
Stelux Holdings Ltd.	Con. Enterprise
Wing On International Holdings Ltd.	Con. Enterprise
Portfolio 3	
San Miguel Brewery Ltd.	Department Store
Regal Hotels International Holdings Ltd.	Hotel
Shaw Brothers (HK) Ltd.	Communication
Tai Cheung Holdings Ltd.	Property
Chinese Estates Holdings Ltd.	Property
Lai Sun Garment (International) Ltd.	Con. Enterprise
Great Eagle Holdings Ltd.	Property
Portfolio 4	
Winsor Industrial Corporation Ltd.	Industry
Sime Darby Hong Kong Ltd.	Con. Enterprise
Hongkong Realty & Trust Co. Ltd. ' A'	Property
Wing Lung Bank Ltd.	Finance
Shun Tak Holdings Ltd.	Transport
Miramar Hotel & Investment Co Ltd.	Hotel
Hong Kong Aircraft Engineering Co. Ltd.	Industry
Largest Portfolio	
The Hongkong & Shanghai Hotels Ltd.	Hotel
Dairy Farm International Holdings Ltd.	Department store
Jardine Matheson Holdings Ltd.	Con. Enterprise
Swire Pacific Ltd. 'A'	Con. Enterprise
Cathay Pacific Airways Ltd.	Transport
Sun Hung Kai Properties Ltd.	Property
Cheung Kong (Holdings) Ltd.	Property

Note : Con. Enterprise denotes Consolidated Enterprise.

APPENDIX 2

AVERAGE MARKET VALUE OF COMPANIES OF THE FIVE PORTFOLIOS

	Average Capitalization (HK$)
Smallest Portfolio	
Burwill Holdings Ltd.	263,273,024
Chuang's Consortium International Ltd.	265,038,061
Far East Hotels & Entertainment Ltd.	269,994,475
Chung Wah Shipbuilding & Engineering (Holdings) Co. Ltd.	308,571,718
Far East Consortium International Ltd.	474,329,429
Crocodile Garments Ltd.	575,018,844
Wong's International (Holdings) Ltd.	584,856,980
Portfolio 2	
Chevalier International Holdings Ltd.	614,853,493
Lam Soon (HK) Ltd.	677,111,296
Lane Crawford International Ltd. 'A'	700,438,750
Furama Hotel Enterprises Ltd.	911,058,326
China Entertainment & Land Investment Holdings Ltd	927,382,916
Stelux Holdings Ltd.	1,055,090,703
Wing On International Holdings Ltd.	1,309,068,750
Portfolio 3	
San Miguel Brewery Ltd.	1,352,919,744
Regal Hotels International Holdings Ltd.	1,473,126,013
Shaw Brothers (HK) Ltd.	1,568,662,200
Tai Cheung Holdings Ltd.	1,628,694,672
Chinese Estates Holdings Ltd.	1,781,140,298
Lai Sun Garment (International) Ltd.	1,858,257,696
Great Eagle Holdings Ltd.	2,064,925,038
Portfolio 4	
Winsor Industrial Corporation Ltd.	2,133,441,560
Sime Darby Hong Kong Ltd.	2,301,788,438
Hongkong Realty & Trust Co. Ltd. 'A'	2,493,758,273
Wing Lung Bank Ltd.	2,508,192,000
Shun Tak Holdings Ltd.	2,627,423,165
Miramar Hotel & Investment Co. Ltd.	2,859,106,292
Hong Kong Aircraft Engineering Co. Ltd.	3,024,831,250
Portfolio 5	
The Hongkong & Shanghai Hotels Ltd.	4,402,847,313
Dairy Farm International Holdings Ltd.	10,809,514,005
Jardine Matheson Holdings Ltd.	17,217,030,156
Swire Pacific Ltd. 'A'	19,408,622,868
Cathay Pacific Airways Ltd.	21,743,764,449
Sun Hung Kai Properties Ltd.	25,082,191,733
Cheung Kong (Holdings) Ltd.	29,583,142,024

BIBLIOGRAPHY

Books

Elton, Edwin J., and Gruber, Martin J. *Modern Portfolio Theory and Investment Analysis*. 4th ed. New York: John Wiley & Sons, 1991.

Harrington, Diana R. *Modern Portfolio Theory and the Capital Asset Pricing Model: A User's Guide*. Englewood Cliffs, New Jersey: Prentice-Hall, 1983.

Sharpe, William F. and Alexander, Gordon J. *Investments*. 4th ed. Englewood Cliffs, New Jersey: Prentice-Hall, 1990.

Periodicals

Banz, Rolf W. "The Relationship between Return and Market Value of Common Stocks." *Journal of Financial Economics*, Vol. 9 (1981), pp. 3-18.

Basu, Sanjoy. "Investment Performance of Common Stocks in Relation to their Price-Earnings Ratios: A Test of the Efficient Market Hypothesis." *Journal of Finance*, Vol. 32 (1977), pp. 663-682.

Basu, Sanjoy. "The Relationship between Earnings' Yield, Market Value and Return for NYSE Common Stocks: Further Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 129-156.

Berges, A., McConnell, J.J. and Schlarbaum, G.G. "The Turn-of-the-year in Canada." *Journal of Finance*, Vol. 39 (1984), pp. 185-192.

Blume, Marshall E. and Stambaugh, Robert F. "Biases in Computed Returns: An Application to the Size Effect." *Journal of Financial Economics*, Vol. 12 (1983), pp. 387-404.

Branch, B. "A Tax Loss Trading Rule." *Journal of Business*, Vol. 50 (1977), pp. 198-207.

Brown, Philip, Keim, Donald B., Kleidon, Allan W. and Marsh, Terry A. "Stock Return Seasonalities and the Tax-Loss Selling Hypothesis: Analysis of the Arguments and Australian Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 105-127.

Brown, Philip, Kleidon, Allan W. and Marsh, Terry A. "New Evidence on the Nature of Size-Related Anomalies in Stock Prices." *Journal of Financial Economics*, Vol. 12 (1983), pp. 33-56.

Cook, T.J. and Rozeff, M.S. "Size and Earnings/Price Ratio Anomalies: One Effect or Two?" *Journal of Financial and Quantitative Analysis*, Vol. 19 (1984), pp. 449-66.

Dawson, S. "Is the Hong Kong Market Efficient?" *Journal of Portfolio Management*, 1982, pp. 17-20.

DeBondt, F.M. and Thaler, R. "Does the Stock Market Overreact?" *Journal of Finance*, July 1985, pp. 793-806.

Dimson, E. "Risk Measurement when Shares are Subject to Infrequent Trading." *Journal of Financial Economics*, Vol. 7 (1979), pp. 197-226.

Dyl, E.A. "Capital Gains Taxation and Year-end Stock Market Behaviour." *Journal of Finance*, Vol. 32, pp. 165-175.

Fama, Eugene F. and MacBeth, James D. "Risk, Return and Equilibrium: Empirical Tests." *Journal of Political Economy*, Vol. 81 (1973), pp. 607-636.

French, Kenneth R. "Stock Returns and the Weekend Effect." *Journal of Financial Economics*, Vol. 8 (1980), pp. 55-70.

Friend, Irwin and Lang, Larry H.P. "The Size Effect on Stock Returns: Is It Simply a Risk Effect not Adequately Reflected by the Usual Measures?" *Journal of Banking and Finance*, Vol. 12 (1988), pp. 13-30.

Gibbons, Michael R. and Hess, Patrick J. "Day of the Week Effects and Asset Returns." *Journal of Business*, Vol 54 (1981), pp. 579-596.

Gultekin, M.N. and Gultekin, N.B. "Stock Market Seasonality: International Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 469-481.

Handa, Puneet, Kothari, S.P. and Wasley, Charles. "The Relation between the Return Interval and Betas: Implications for the Size Effect." *Journal of Financial Economics*, Vol. 23 (1989), pp. 79-100.

Jaffe, J., Keim, D.B. and Westerfield, R. "Earnings Yields, Market Values, and Stock Returns." *Journal of Finance*, Vol. 44 (1989), pp. 135-148.

James, C. and Edmister, R. "The Relation between Common Stock Returns, Trading Activity and Market Value." *Journal of Finance*, Vol. 38 (1983), pp. 1075-1086.

Kato, K. and Schallheim, J.S. "Seasonal and Size Anomalies in the Japanese Stock Market." *Journal of Financial and Quantitative Analysis*, Vol. 20, No. 2 (1985), pp. 243-260.

Keane, S.M. "The Mystery of January and Small Firms." *The Accountant's Magazine*, July 1985, pp. 313-314.

Keim, Donald B. "Size-related Anomalies and Stock Return Seasonality: Empirical Evidence." *Journal of Financial Economics*, Vol. 12 (1983), pp. 13-32.

Lamoureux, Christopher G. and Sanger, Gary C. "Firm Size and Turn-of-the-Year Effects in the OTC/NASDAQ Market." *Journal of Finance*, Vol. 44, No. 5 (1989), pp. 1219-1245.

Law, C.K. "A Test of the Efficient Market Hypothesis with respect to the Recent Behaviour of the Hong Kong Stock Market." *Developing Economics*, 1982, pp. 61-72.

Levis, M. "Are Small Firms Big Performers?" *The Investment Analyst*, Vol. 76 (1985), pp. 21-27.

Levis, M. "Stock Market Anomalies: A Re-assessment Based on the UK Evidence." *Journal of Banking and Finance*, Vol. 13 (1989), pp. 675-696.

Lloyd, William P., Jahera, John S. and Goldstein, Steven J. "The Relation between Returns, Ownership Structure and Market Value." The Journal of Financial Research, Vol. 9 (1986), No. 2, pp. 171-177.

Markowitz, Harry M. "Portfolio Selection." *Journal of Finance*, Vol. 7 (1952), pp. 77-91.

Officer, Robert R. "Seasonality in the Australian Capital Markets: Market Efficiency and Empirical Issues." *Journal of Financial Economics*, Vol. 2 (1975), pp. 29-52.

Pang, K.L. Queenie, "An Analysis of the Hong Kong Stock Return Seasonality and Firm Size Anomalies for the Period 1977 to 1986", *Hong Kong Journal of Business Management*, Vol. 6 (1988), 69-90.

Reinganum, Marc R. "Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings' Yields and Market Values." *Journal of Financial Economics*, Vol. 9 (1981), pp. 19-46.

Reinganum, Marc R. "The Arbitrage Pricing Theory: Some Empirical Results." *Journal of Finance*, Vol. 36 (1981), pp. 313-321.

Reinganum, Marc R. "A Direct Test of Roll's Conjecture on the Firm Size Effect." *Journal of Finance*, Vol. 37 (1982), pp. 27-35.

Reinganum, Marc R. "The Anomalous Stock Market Behaviour of Small Firms in January: Empirical Tests for Tax-loss Selling Effects." *Journal of Financial Economics*, Vol. 12 (1983), pp. 89-104.

Rogers, R.C. "The Relationship between Earnings Yield and Market Values: Evidence from the American Stock Exchange." *The Financial Review*, Vol. 23 (1988), pp. 65-80.

Roll, Richard. "A Possible Explanation of the Small Firm Effect." *Journal of Finance*, Vol. 36 (1981), pp. 879-888.

Roll, Richard. "On Computing Mean Returns and the Small Firm Premium." *Journal of Financial Economics*, Vol. 12 (1983), pp. 371-386.

Roll, Richard. "Vas ist das? The Turn of the Year Effect and the Return Premium of Small Firms." *Journal of Portfolio Management*, Vol. 9 (1983), pp. 18-28.

Ross, Stephen A. "The Arbitrage Theory of Capital Asset Pricing." *Journal of Economic Theory*, Vol. 13 (1976), pp. 341-360.

Rozeff, Michael S. and Kinney, William R. "Capital Market Seasonality: The Case of Stock Returns." *Journal of Financial Economics*, Vol. 3 (1976), pp. 379-402.

Santesmases, M. "An Investigation of the Spanish Stock Market Seasonality." *Journal of Business Finance and Accounting*, No. 2 (1986), pp. 267-276.

Schultz, Paul. "Transaction Costs and the Small Firm Effect: A Comment." *Journal of Financial Economics*, Vol. 12 (1983), pp. 81-88.

Schwert, G. William. "Size and Stock Returns, and Other Empirical Regularities." *Journal of Financial Economics*, Vol.12 (1983), pp. 3-12.

Sharpe, William F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance*, Vol. 19 (1964), pp. 425-442.

Stoll, Hans R. and Whaley, Robert E. "Transaction Costs and the Small Firm Effect." *Journal of Financial Economics*, Vol. 12 (1983), pp. 57-79.

Tinic, S.M. and West, R.R. "Risk and Return: January vs the Rest of the Year." *Journal of Financial Economics*, Vol. 13 (1984), pp. 561-574.

Wachtel, S.B. "Certain Observations in Seasonal Movements in Stock Prices." *Journal of Business*, Vol. 15 (1942), pp. 184-193.

Wong, K.A. and Kwong, K.S. "The Behaviour of Hong Kong Stock Prices." *Applied Economics*, 1984, pp. 905-917.

Wong, K.A. and Lye, M.S. "Market Values, Earnings' Yields and Stock Returns: Evidence from Singapore." *Journal of Banking and Finance*, Vol. 14 (1990), pp. 311-326.